Designing Sustainable Landscapes in the Northeast A project of the North Atlantic Landscape Conservation Cooperative & Northeast Climate Science Center

> Landscape Conservation Design May, 2014

# Landscape Conservation Design Step 2: Design Conservation Network

# Adaptive Landscape Conservation Design

Establish Conservation Goals & Objectives

Adjust ConNet ConNet Evaluate

ConNet

Ecological Socio-cultural Economic Design ConNet

Implement ConNet

**Monitor ConNet** 

**Design Steps:** 1. Select (tiered) core areas **Current focus** 2. Prioritize within/among cores 3. Create core area buffers 4. Delineate corridors among cores 5. Prioritize within/among corridors 6. Determine management needs 7. Identify restoration opportunities

**Landscape Conservation Design** 

**Step 2: Design Conservation Network** 

• Field verification at all steps

 Socio-cultural and economic considerations at all steps

## **Step 2: Design Conservation Network**

1. Select (tiered) core areas

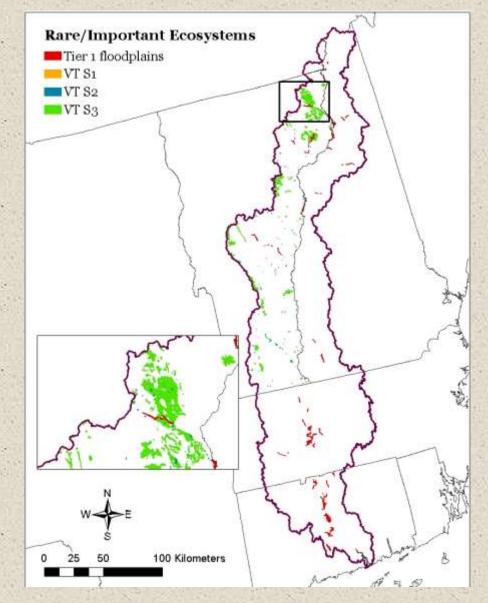
#### Three scenarios:

• Ecosystem approach (coarse filter)... based solely on ecosystem conditions

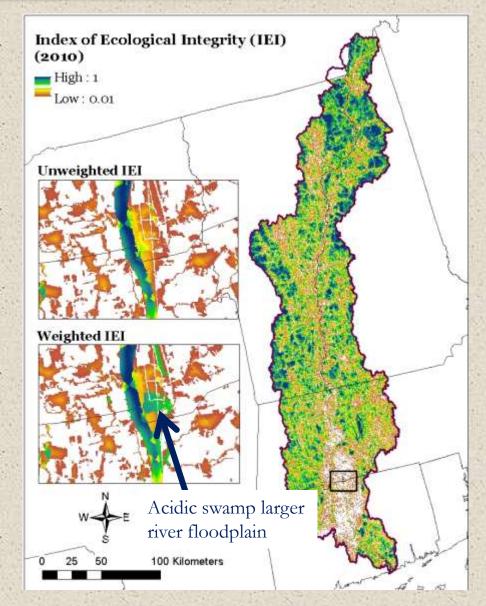
Quick follow up

- Species approach...
   based solely on focal species considerations
- Combined ecosystem-species approach... based on the complement of ecosystems and species

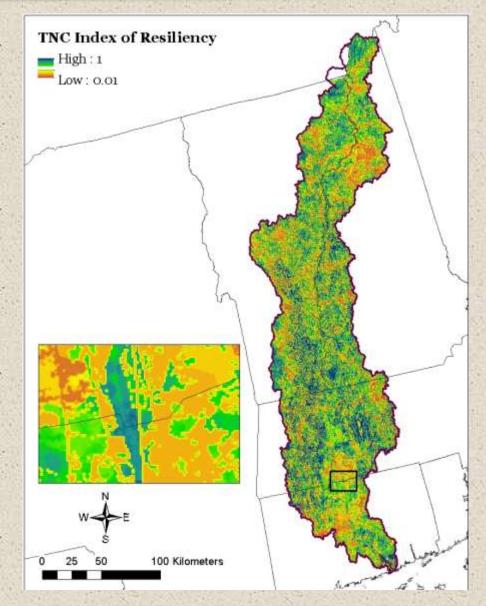
- 1. Select (tiered) core areas
  - **Ecosystem approach:**
  - a) Rare/Important systems
  - b) DSL Index of Ecological Integrity (IEI)
  - c) TNC Resiliency
    d) USGS headwater stream temp sensitivity



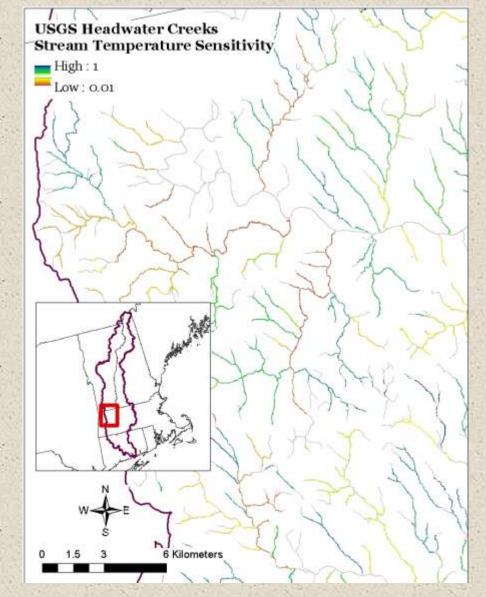
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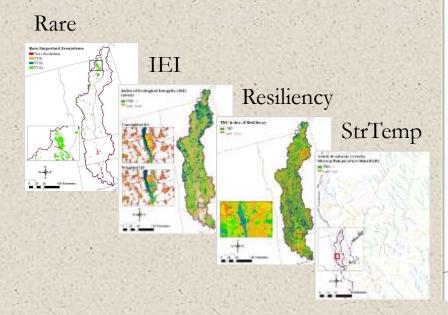


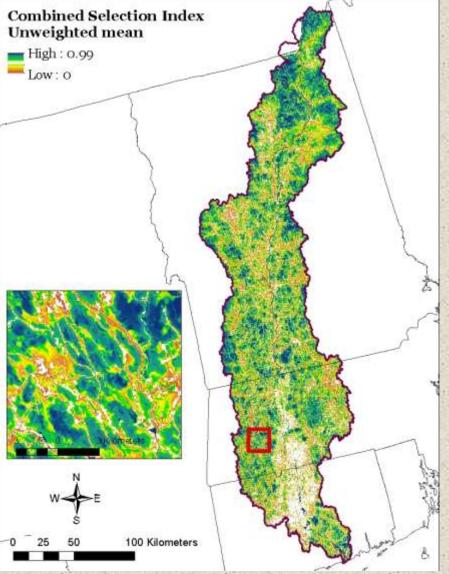
# **Step 2: Design Conservation Network**

1. Select (tiered) core areas

**Ecosystem approach:** 

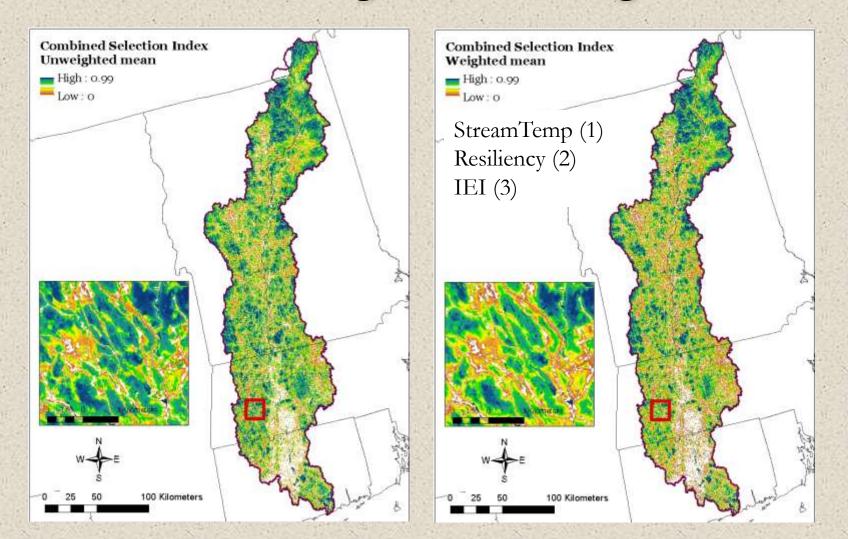
• Combine the products into a single selection index





#### **Step 2: Design Conservation Network**

#### Selection index: unweighted versus weighted



#### **Step 2: Design Conservation Network**

1. Select (tiered) core areas

Ecosystem approach:

Key decisions remaining:

1. Weight aquatic systems/macrogroups?

2. Weight geo-physical settings (for Resiliency)?

3. Weight components of core area selection index?

4. How much land area to allocate to core areas?

5. Should there be a minimum core area size?

6. How to delineate core area for aquatics?



#### **Step 2: Design Conservation Network**

1. Select (tiered) core areas

#### Three scenarios:

- Ecosystem approach (coarse filter)...
   based solely on ecosystem conditions
- Species approach...
   based solely on focal species considerations

Today's focus!

 Combined ecosystem-species approach... based on the complement of ecosystems and species

#### **Step 2: Design Conservation Network**

1. Select (tiered) core areas

Focal species approach:

- a) Establish targets based on objectives\*
  b) Create selection index
  c) Select core areas to
  - meet targets

 Translate each species' objective into percentage of current Landscape Capability (LC)

*\*Under the assumption that species objectives can be translated into landscape capability units* 

# **Step 2: Design Conservation Network**

#### Representative species:

- American woodcock
- Black bear
- Blackburnian warbler
- Blackpoll warbler
- Brook trout\*
- Eastern meadowlark
- Louisiana waterthrush
- Marsh wren
- Moose
- Northern waterthrush
- Ruffed grouse
- Wood duck
- Wood turtle
- Wood thrush

- American black duck (B)
- American black duck (NB)
- American oystercatcher
- Bicknell's thrush
- Box turtle
- Brown-headed nuthatch
- Cerulean warbler
- Common loon
- Diamondback terrapin
- Ovenbird
- Prairie warbler
- Red-shouldered hawk
- Saltmarsh sparrow
- Sanderling migratory
- Snowshoe hare
- Snowy egret
- Virginia rail

# **Step 2: Design Conservation Network**

#### Other species:

#### Terrestrial/wetland species:

- ✓ Bat hibernacula
- ✓ Puritan and Cobblestone tiger beetles
- Others?

#### Aquatic species:

- Diadromous fish
- Others?



\*Contingent on availability of extant digital data (i.e., existing maps)

#### **Step 2: Design Conservation Network**

Information to inform representative species targets:

- Extent... total current *landscape capability* (*LC*) for each species within the <u>region</u> and <u>landscape</u>.
- Landscape importance... proportion of each species' regional *LC* contained within the landscape.
- Climate change vulnerability... proportional change in *landscape capability (LC)* due to climate change within the region and landscape.
- Landscape change vulnerability... proportional change in *landscape capability* (*LC*) within the <u>region</u> and <u>landscape</u>.
- Others? (population trends, limiting factors)

#### **Step 2: Design Conservation Network**

#### Information to inform species targets:

Current (2010) Landscape Capability (LC)			River 1portance (%)	Landscape Change Vulnerability (2080) (%) Climate & Climate Land use			Weight	
Species	NE	CTR	Im	NE	CTR	NE	CTR	Ň
Blackpoll warbler	1,830,296	278,649	15.2	-94.3	-93.7	tbd	tbd	
Eastern meadowlark	7,335,627	53,807	0.7	17.4	43.7	tbd	tbd	
			•••	•••	••••		••••	

\*Weights specified in terms of percent of current LC within the CTR?

#### **Step 2: Design Conservation Network**

- 1. Select (tiered) core areas
  - Focal species approach:
  - a) Establish targets based on objectives
  - b) Create selection indexc) Select core areas to meet targets

• Which products do we include and how do we weight them?



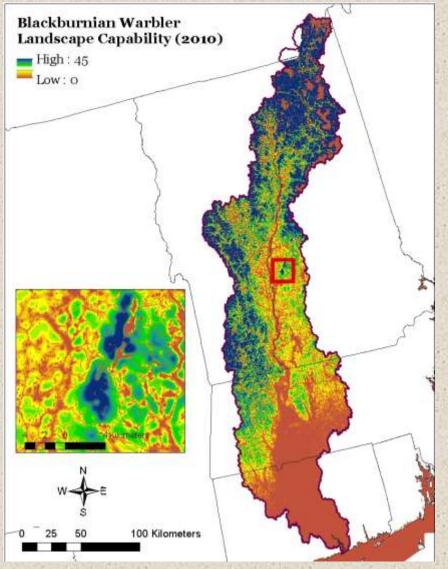
# **Step 2: Design Conservation Network**

1b) Create selection index

For each representative species:

- <u>Current</u> (2010) landscape capability (LC)
  - 0-100 index
  - 30 m resolution





# Landscape Assessment

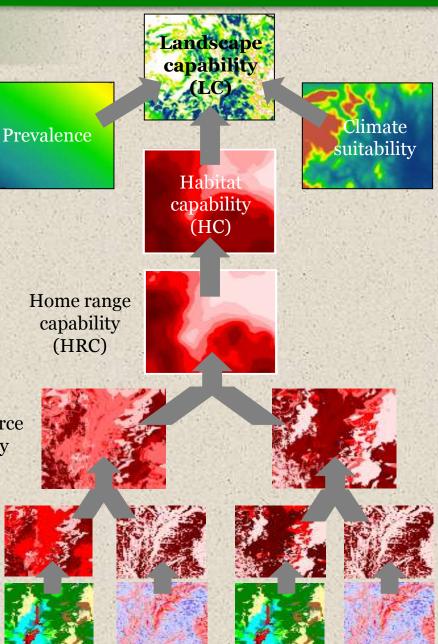
# **Species**

- Landscape capability index
  - Spatially-explicit
  - Multi-scale
  - Expert/empirically -derived
  - Synthesis of habitat capability, climate suitability, and prevalence
  - Statistically validated

Local resource availability (LRA)

Local resource indices

Environmental variables

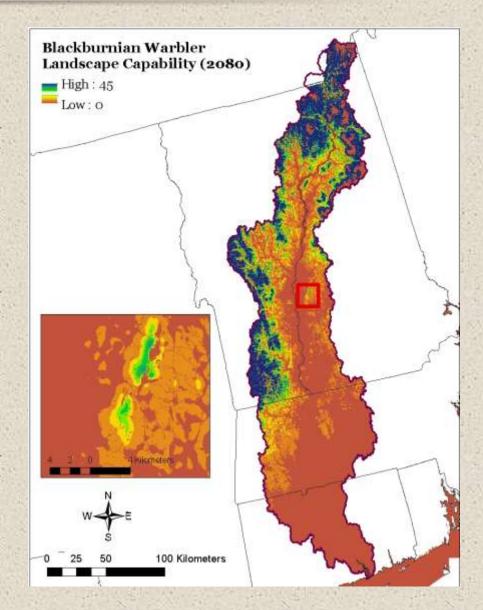


# **Step 2: Design Conservation Network**

1b) Create selection index

For each representative species:

- <u>Future</u> (2030 or 2080)
   *landscape capability* (LC)
  - 0-100 index
  - 30 m resolution



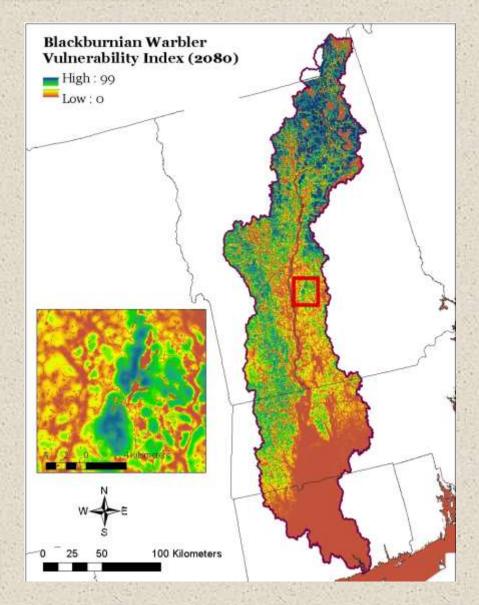
# **Step 2: Design Conservation Network**

1b) Create selection index

For each representative species:

- <u>Vulnerable</u> landscape capability (LC)
  - Delta LC times current LC
  - 0-100 index
  - 30 m resolution

"High vulnerability" areas

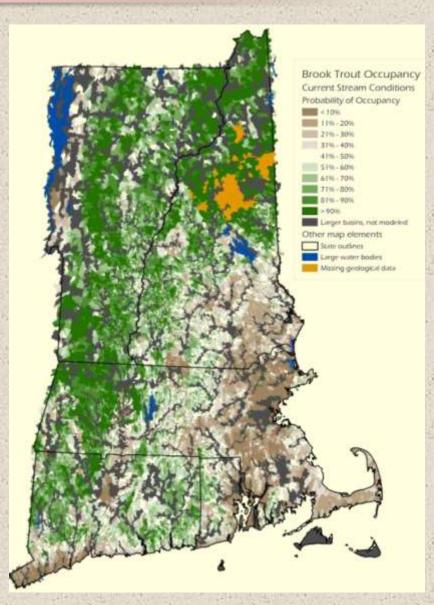


# **Step 2: Design Conservation Network**

1b) Create selection index

For brook trout:

- Current (2010) occupancy
  - Probability of occupancy (0-1)
  - Catchment resolution
  - Headwater creeks

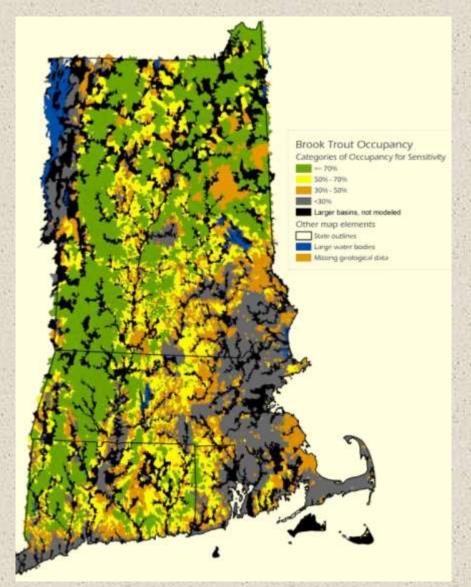


# **Step 2: Design Conservation Network**

1b) Create selection index

For brook trout:

- Future occupancy sensitivity
  - Probability of occupancy (0-1) under future climate conditions
  - Catchment resolution
  - Headwater creeks

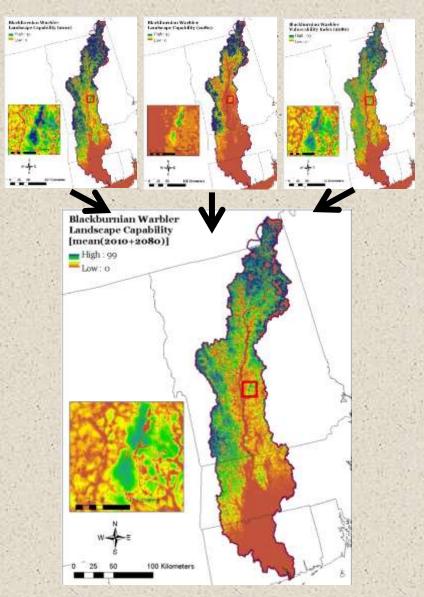


# **Step 2: Design Conservation Network**

1b) Create selection index

For each species:

- Combine products (mean/ weighted mean?):
  - Current LC
  - Future LC
  - Persistent LC
  - Vulnerable LC
- Quantile scale final result (to facilitate selecting top x%)

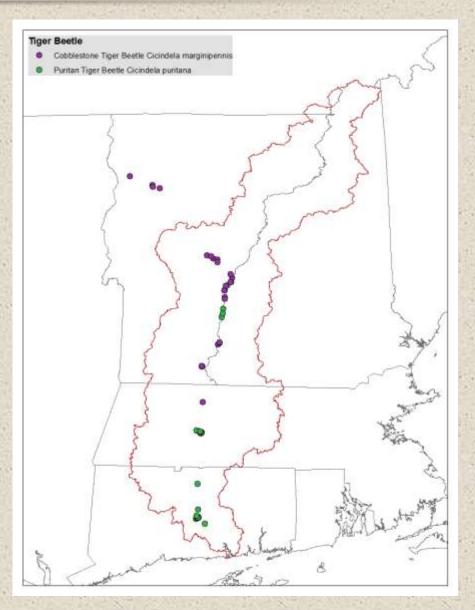


## **Step 2: Design Conservation Network**

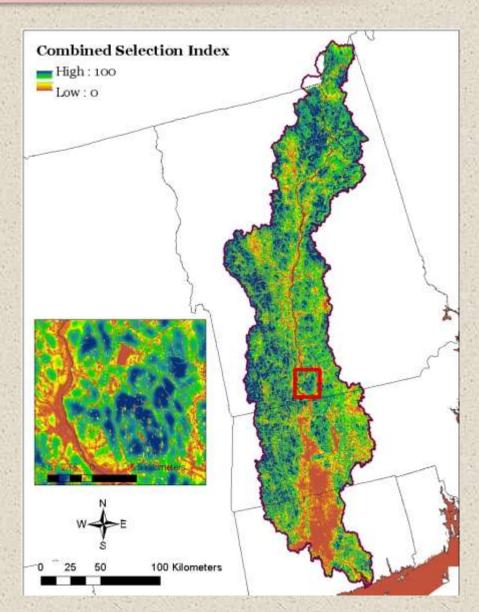
1b) Create selection index

For <u>rare</u> species:

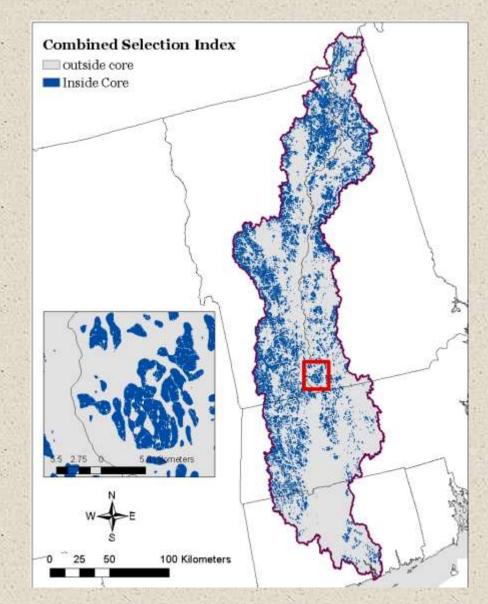
• Binary (0 vs 1) maps of critical habitat?



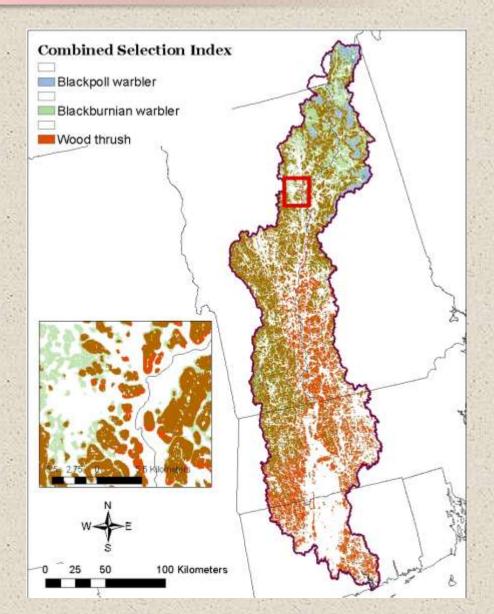
- 1. Select (tiered) core areas
  - Focal species approach:
  - a) Establish targets based on objectives
    b) Create selection index
    c) Select core areas to meet targets



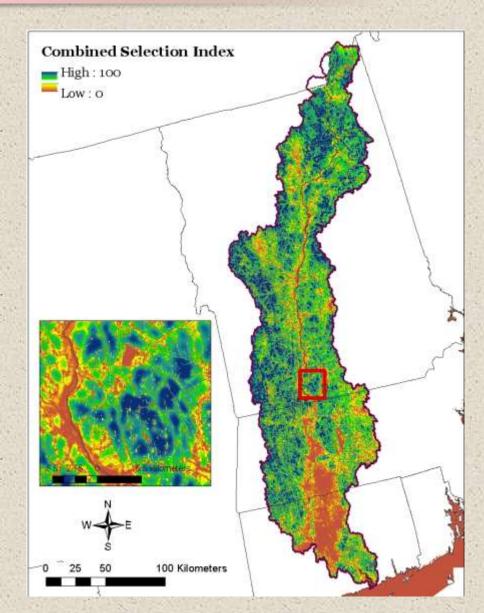
- 1c) Select core areas to meet targets Issues:
  - How much area do we include? Do we constrain by the total area in cores or the individual species' objectives?



- 1c) Select core areas to meet targets
  <u>Issues:</u>
  - How do we optimally combine species' habitat needs?

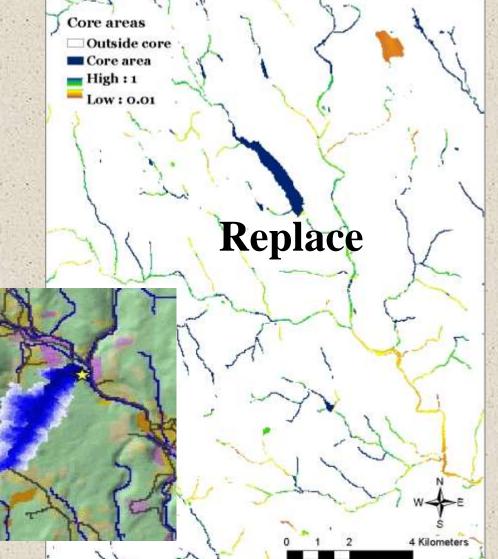


- 1c) Select core areas to meet targets
  <u>Issues:</u>
  - Should we enforce a minimum size for core areas?



- 1c) Select core areas to meet targets
  - Issues:
  - How do we delineate core areas for aquatic species?



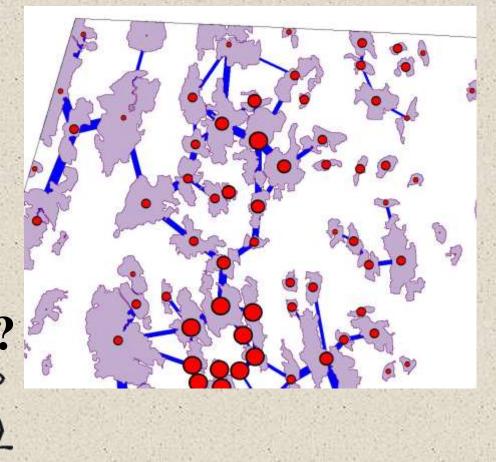


## **Step 2: Design Conservation Network**

#### 2. Prioritize core areas

- a) Prioritize among core areas
- b) Prioritize within core areas
- Based on importance to regional connectivity
- Other considerations?

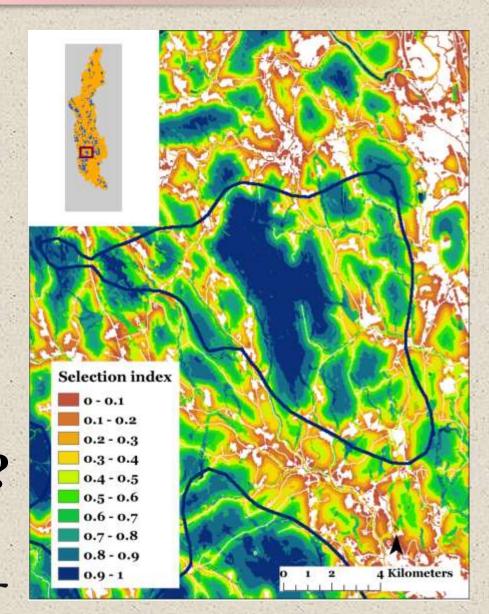
#### Node importance index



## **Step 2: Design Conservation Network**

#### 2. Prioritize core areas

- a) Prioritize among core areas
  b) Prioritize within core areas
- Based on core area selection index
- Other considerations?

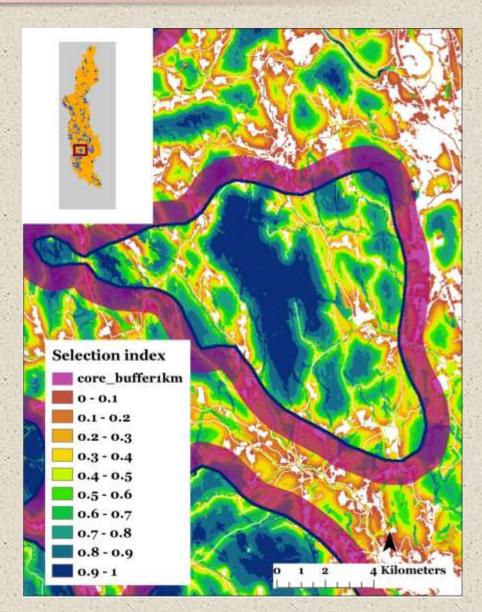


# **Step 2: Design Conservation Network**

- 3. Create core area *Buffers* 
  - a) Buffer terrestrial and wetland habitat core areas
    b) Buffer aquatic habitat core areas



• Perhaps the buffer = 2<sup>nd</sup> tier core?

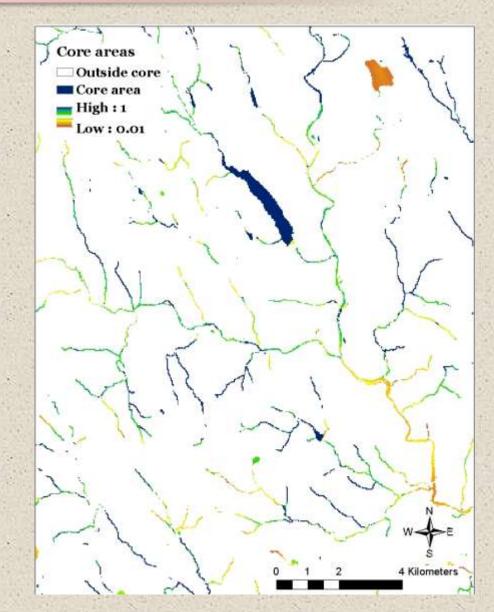


# **Step 2: Design Conservation Network**

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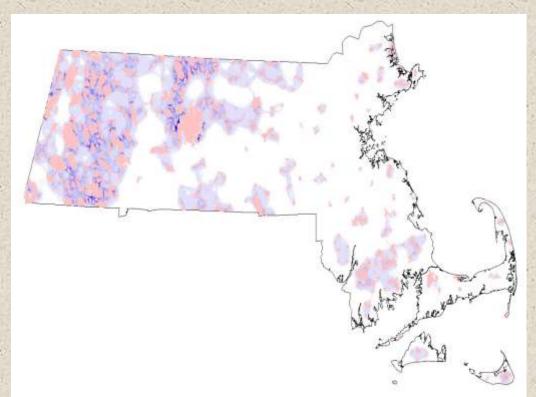
• Perhaps the buffer = core for aquatics?



## **Step 2: Design Conservation Network**

#### 4. Delineate Corridors

a) Find links between core areas (random low-cost paths)
b) Compute conductance index
c) Delineate corridors

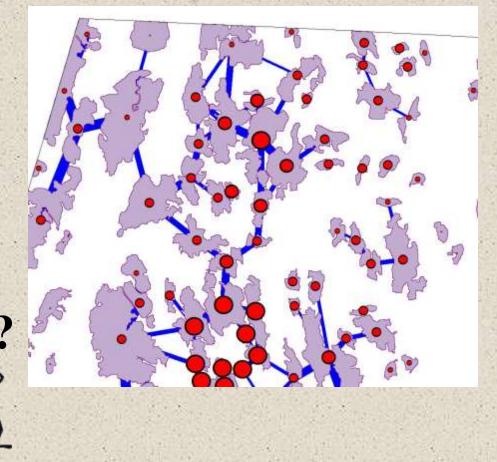


# **Step 2: Design Conservation Network**

#### 5. Prioritize Corridors

- a) Prioritize among corridors
- b) Prioritize within corridors
- Based on importance to regional connectivity
- Other considerations?

#### Link importance index

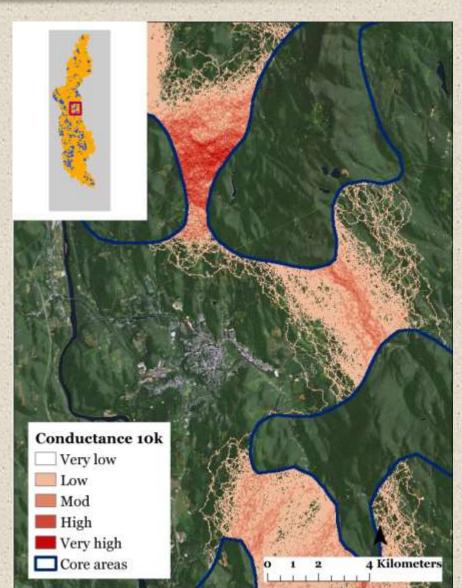


#### **Step 2: Design Conservation Network**

5. Prioritize Corridors

- a) Prioritize among corridors
- b) Prioritize lands within corridors
- Based on local conductance index
- Other considerations?





#### **Step 2: Design Conservation Network**

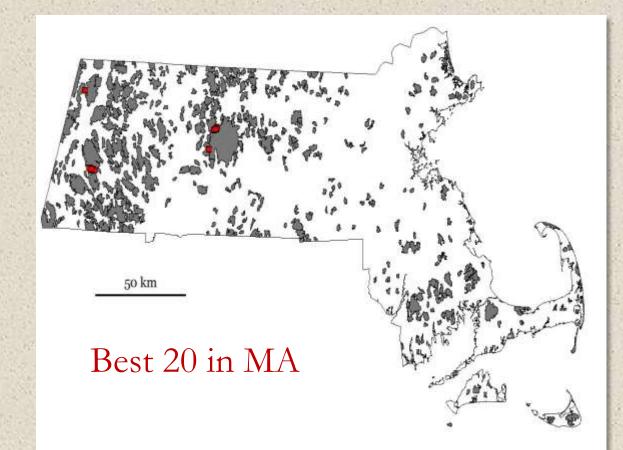
6. Determine *management* needs (and prioritize within core areas, buffers and corridors)

- Are there <u>habitat</u> management needs for particular species?
- If so, what are they?
- Is this best handled outside of the conservation design?

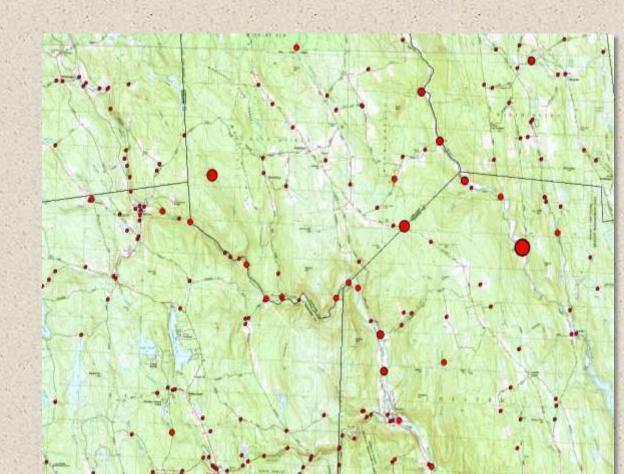




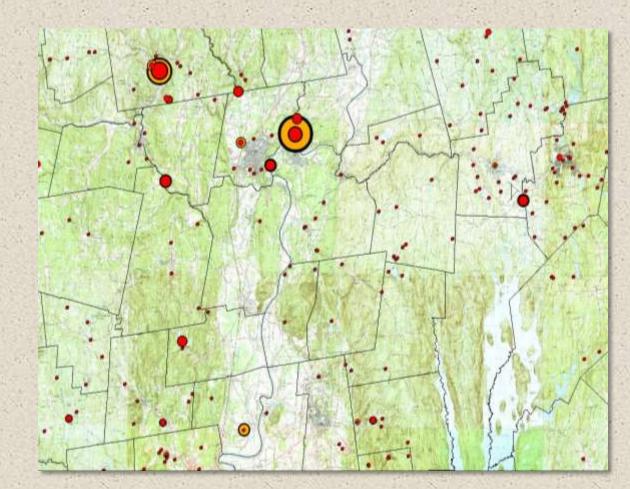
- 7. Identify *restoration* opportunities
  - Road passage structures
  - Road-stream crossings
  - Dams
  - Wetland restoration?



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## **Step 2: Design Conservation Network**

# **Design Steps:**

1. Select (tiered) core areas 2. Prioritize within/among cores 3. Create core area buffers 4. Delineate corridors among cores 5. Prioritize within/among corridors 6. Determine management needs 7. Identify restoration opportunities

# **Step 2: Design Conservation Network**

#### **Key Decisions:**

- 1. Establish species' objectives and targets
- 2. Weight current versus future landscape capability
- 3. Weight components of core area selection index
- 4. How much land area to allocate to core areas
- 5. Should there be a minimum core area size
- 6. How to delineate core area for aquatic species
- 7. How to identify management priorities



#### **For More Information**

#### Project website:

#### www.umass.edu/landeco/research/nalcc/nalcc.html

CAPS



1054 Documentation DSt Presentations DSI. Products

Landscapes project, or DSE for short) is to assess the capability of current and potential fiture. landscapes, currently within the extent of the Northeast (13 states), to provide integral ecosystems FRAGSTATS and suitable habitat for a suite of focal (e.g., representative) species, and provide guidance for strategic habitat conservation. To meet this goal, we are developing a Landscape Change, Assessment and Design (LCAD) model, as described in the documentation. This project is supported primarily by the North Atlantic Landscape Conservation Cooperative (NALCC) with HABIT additional support from the Northeast Climate Science Center (NECSC) and the University of Massachusetts - Anheest RMLands

Links to products: Overview Technical docs Presentations Results

#### Feedback:

#### Manager online survey

North Atlantic Landscape Conservation Cooperative Designing Sustainable Landscapes (DSL) Project

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#### Manager Feedback and Questionaire

wir prinzele für gentaturele of the sole-regional vanladinge hang held with partnere of the Narth Allentic Landician Conservables review the results and provide herditack on phase I of the Dili, project, Although any NKUT, partner a veikame to provide herditack Secificale, the discurrent includes a set of questions pored to partners concerning how test to participe the budgage design information resulting from the candidgine change. Automatient and Design (CAUL) model applied to Be write Hardware II phase 2.

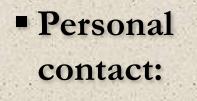
#### Criteria for Feedback

The DSL project area to provide reptinuly conserver information pertaining to blatternity or the set in most if a process to recepture the following criteria altern privating feedback. 17 471750 data privaters must be regional (i.e., itself-ead) in when: There are lety of data that would be under to (240) for ananyte digitar prevatant one trenty data. If they were available across the interfaced to the use of digital data that we consider across the interfaced. (1) Approaches for modeling indicates charge, assessment and design must be technicaly busite provide and and animal computing mount as there may be also approaches that we are complicationals inside priminalities data and/or computing inscissions

#### General topics

() When the (CHD model's extended to the write furtheast in place ), what is the best set of group splits the (unit) for resulting or inspectively thy and warmanitariting the model results?

- TO BY STREET
- By watershed Darkoted areleved HUC level in the comment has helped
- By ecoregine indicated preferred ecoregics (basilication and local in the comment that behavior
- 1 Other (describe alternative thing achieves in the convenient time below).



mcgarigalk(a) eco.umass.edu 413-577-0655